(F) Estimate maximum hourly ambient air concentrations. In this step, pollutant-specific emission rates are multiplied by appropriate dispersion coefficients to estimate ambient air concentrations. For each stack, emissions are multiplied by the dispersion coefficient selected in Step 10(E) and summed across all stacks to estimate ambient air concentrations at various distances from the facility. From these summed concentrations, the maximum hourly ambient air concentration is selected. First, select the maximum emission rate of the pollutant.[11] Record these data in the spaces provided below.[12]

MAXIMUM ANNUAL EMISSION RATES (G/SEC)

Pollutant	Stack 1	Stack 2	Stack 3
	....	....	....
	....	....	....

Complete a separate copy of Worksheet 5.0-2 for each pollutant and select the highest hourly concentration from the summation column at the far right of the worksheet. Record the maximum hourly air concentration for each pollutant analyzed (add additional lines if needed):

Pollutant	Maximum hourly air concentration
	....
	....

[11] Recall that it is recommended that this analysis be performed for only one or two pollutants. The pollutants chosen for this analysis should be those that show the most significant exceedances of the risk threshold.

[12] Refer to Step 8 of the basic screening procedure. At this point in the screening procedure, annual emissions are used to represent hourly average emission rates. These values will be adjusted by the annual/hourly ratio to estimate annual average concentrations.

Worksheet 5.0-2 Maximum Hourly Ambient Air Concentration

Pollutant ____________

Total Distance (km)	Stack 1 ER x DC = C	Stack 2 ER x DC = C	Stack 3 ER x DC = C	Summed Concentration from all Stacks
0.20	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.25	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.30	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.35	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.40	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.45	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.50	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.55	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.60	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.65	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.70	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.80	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.85	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.90	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
0.95	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
1.00	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
1.10	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
1.20	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
1.30	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
1.40	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___
1.50	___ x ___ = ___	___ x ___ = ___	___ x ___ = ___	___

ER= Annual Average Emission Rate
DC= Hourly Dispersion Coeffiecient (from Worksheet 5.0-1)
C= Estimated Maximum Hourly Ambient Air Concentration

Worksheet 5.0-2 Maximum Hourly Ambient Air Concentration

Pollutant ____________

Total Distance (km)	Stack 1 ER x DC = C	Stack 2 ER x DC = C	Stack 3 ER x DC = C	Summed Concentration from all Stacks
1.60	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
1.70	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
1.80	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
1.90	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.25	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.50	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.75	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
3.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
4.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
5.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
6.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
7.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
8.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
9.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
10.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
15.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
20.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____

ER=Annual Average Emission Rate
DC= Hourly Dispersion Coefficient (from Worksheet 5.0-1)
C= Estimated Maximum Hourly Ambient Air Concentration

Worksheet 5.0-2 Maximum Ambient Air Concentration

Pollutant ____________

Total Distance (km)	Stack 1 ER x DC = C	Stack 2 ER x DC = C	Stack 3 ER x DC = C	Summed Concentration from all Stacks
1.60	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
1.70	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
1.80	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
1.90	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.25	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.50	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
2.75	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
3.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
4.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
5.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
6.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
7.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
8.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
9.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
10.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
15.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____
20.00	____ x ____ = ____	____ x ____ = ____	____ x ____ = ____	____

ER = Annual average emission rate
DC = Hourly dispersion coefficient (from Worksheet 1)
C = Estimated maximum hourly ambient air concentration

(G) Determine the complex/noncomplex designation for each stack. For each stack, subtract the maximum terrain rise within 5 km of the site from the physical stack height and designate the stack as either complex or noncomplex. If the stack height minus the maximum terrain rise (within 5 km) is greater than zero or if the stack is less than 10 meters in physical height, then assign the stack a noncomplex designation. If the stack height minus the maximum terrain rise (within 5 km) is less than or equal to zero, then assign the stack a complex designation.

Perform the following computation for each stack and record the information in the spaces provided. Check in the spaces provided whether the stack designation is complex or noncomplex.

Stack No.	Stack height (m)		Maximum terrain rise (m)			Complex	Noncomplex
1	....	−	....	=	(m)	....	....
2	....	−	....	=	(m)	....	....
3	....	−	....	=	(m)	....	....

(H) Identify annual/hourly ratios. Extract the annual/hourly ratios for each stack by referring to Table 5.0-6. Generic source numbers (from Steps 10(C) or 10(D), urban/rural designation (from Step 6)), and complex or noncomplex terrain designations (from Step 10(G)) are used to select the appropriate scaling factor needed to convert hourly maximum concentrations to estimates of annual average concentrations.

Complete the following table:[13]

Stack No.	Generic source No. steps 10 (C or D)			Annual/hourly ratio (from table 5.0-6)		
	Distance ranges (km)			Distance ranges (km)		
	0-0.5	>0.5-2.5	>2.5-5.0	0-0.5	>0.5-2.5	>2.5-5.0
1						
2						
3						

(I) Select the highest annual/hourly ratio among all of the stacks,[14] and then estimate the maximum annual average ambient air concentrations for each pollutant by completing the following table, where:

C=Maximum total hourly ambient air concentration (μg/m³) for pollutant "N" from Step 10(F).

C_a=Maximum annual average air concentration for pollutant "N" (μg/m³),

R=Annual/hourly ratio.

TABLE 5.0-6.—95TH PERCENTILE OF ANNUAL/HOURLY RATIOS

Noncomplex Terrain			Complex Terrain		
Source	Urban	Rural	Source	Urban	Rural
1	0.019	0.014	1	0.020	0.053
2	0.033	0.019	2	0.020	0.053
3	0.031	0.018	3	0.030	0.057
4	0.029	0.017	4	0.051	0.047
5	0.028	0.017	5	0.067	0.039
6	0.028	0.017	6	0.059	0.034
7	0.031	0.015	7	0.036	0.031
8	0.030	0.013	8	0.026	0.024
9	0.029	0.011	9	0.026	0.024
10	0.029	0.008	10	0.017	0.013

[13] If any stack (excluding generic stack number 1 and 11) in Step 10(D) shows a negative terrain adjusted stack height, use the complex terrain annual/hourly ratios.

[14] As an option, the user can identify the stack with the highest ratio for each distance range (rather than the absolute highest). In this case, extra sheets would be needed to show estimated annual average concentrations from each stack by multiplying emission rate times maximum hourly dispersion coefficient times maximum annual/hourly ratio for applicable distance range. Then sum across all stacks for each downwind distance.

TABLE 5.0–6.—95TH PERCENTILE OF ANNUAL/HOURLY RATIOS—Continued

Noncomplex Terrain			Complex Terrain		
Source	Urban	Rural	Source	Urban	Rural
11	0.0[illegible]8	0.015	11	0.020	0.053

Pollutant	C_* (µg/m³)	×	R	= C_A (µg/m³)
		×		=
		×		=

(J) Use the maximum annual average concentrations from Step 10(I) to determine compliance with regulatory requirements.

SECTION 6.0—SIMPLIFIED LAND USE CLASSIFICATION PROCEDURE FOR COMPLIANCE WITH TIER I AND TIER II LIMITS

6.1 *Introduction*

This section provides a simplified procedure to classify areas in the vicinity of boilers and industrial furnace sites as urban or rural in order to set risk-based emission limits under subpart H of 40 CFR part 266. Urban/rural classification is needed because dispersion rates differ between urban and rural areas and thus, the risk per unit emission rate differs accordingly. The combination of greater surface roughness (more buildings/structures to generate turbulent mixing) and the greater amount of heat released from the surface in an urban area (generates buoyancy-induced mixing) produces greater rates of dispersion. The emission limit tables in the regulation, therefore, distinguish between urban and rural areas.

EPA guidance (EPA 1986) [1] provides two alternative procedures to determine whether the character of an area is predominantly urban or rural. One procedure is based on land use typing and the other is based on population density. Both procedures require consideration of characteristics within a 3-km radius from a source, in this case the facility stack(s). The land use typing method is preferred because it more directly relates to the surface characteristics that affect dispersion rates. The remainder of this discussion is, therefore, focused on the land use method.

While the land use method is more direct, it can also be labor-intensive to apply. For this discussion, the land use method has been simplified so that it is consistent with EPA guidance (EPA 1986; Auer 1978), while streamlining the process for the majority of applications so that a clear-cut decision can be made without the need for detailed analysis. Table 6.0-1 summarizes the simplified approach for classifying areas as urban or rural. As shown, the applicant always has the option of applying standard (i.e., more detailed) analyses to more accurately distinguish between urban and rural areas. However, the procedure presented here allows for simplified determinations, where appropriate, to expedite the permitting process.

TABLE 6.0–1.—CLASSIFICATION OF LAND USE TYPES

Type[1]	Description	Urban or rural designation[2]
I1	Heavy Industrial	Urban.
I2	Light/Moderate Industrial	Urban.
C1	Commercial	Urban.
R1	Common Residential (Normal Easements).	Rural.
R2	Compact Residential (Single Family).	Urban.
R3	Compact Residential (Multi-Family).	Urban.
R4	Estate Residential (Multi-Acre Plots).	Rural.
A1	Metropolitan Natural	Rural.
A2	Agricultural	Rural.
A3	Undeveloped (Grasses/Weeds).	Rural.
A4	Undeveloped (Heavily Wooded).	Rural.
A5	Water Surfaces	Rural.

[1] EPA, Guideline on Air Quality Models (Revised), EPA–450/2–78–027R, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, July, 1986.

[2] Auer, August H. Jr., "Correlation of Land Use and Cover with Meteorological Anomalies," Journal of Applied Meteorology, pp. 636–643, 1978.

6.2 *Simplified Land Use Process*

The land use approach considers four primary land use types: industrial (I), commercial (C), residential (R), and agricultural (A). Within These primary classes, subclasses are identified, as shown in table 6.0-1. The goal is to estimate the percentage of the area within a 3-km radius that is urban type and the percentage that is rural type. Industrial and commercial areas are classified as urban; agricultural areas are classified as rural.

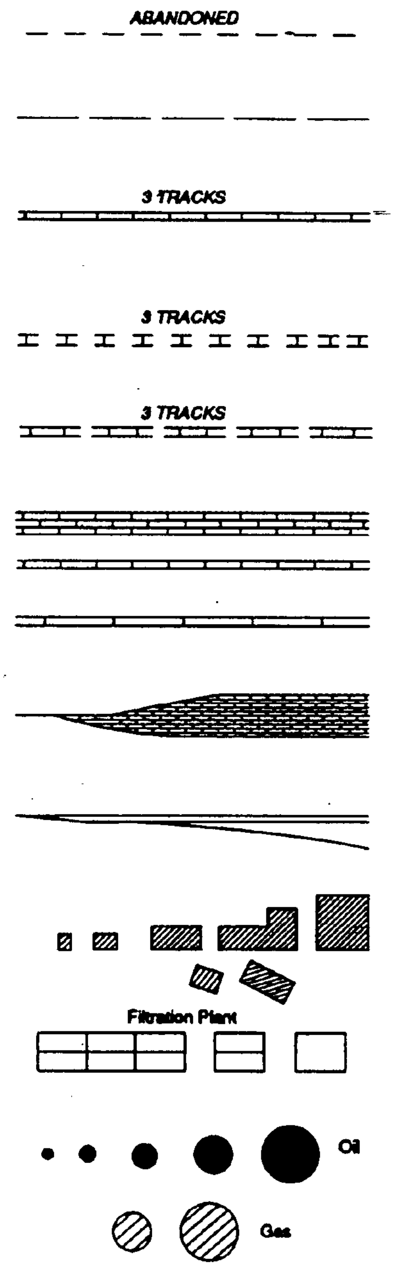
The delineation of urban and rural areas, however, can be more difficult for the residential type areas shown in table 6.0-1. The degree of resolution shown in table 6.0-1 for residential areas often cannot be identified without conducting site area inspections and/or referring to zoning maps. This process can require extensive analysis, which, for many applications, can be greatly streamlined without sacrificing confidence in selecting the appropriate urban or rural classification.

The fundamental simplifying assumption is based on the premise that many applications will have clear-cut urban/rural designations, i.e., most will be in rural settings that can be definitively characterized through a brief review of topographical maps. The color coding on USGS topographical maps provides the most effective means of simplifying the typing scheme. The suggested typing designations for the color codes found on topographical maps are as follows:

Green Wooded areas (rural).

White White areas generally will be treated as rural. This code applies to areas that are unwooded and do not have densely packed structures which would require the pink code (house omission tint). Parks, industrial areas, and unforested rural land will appear as white on the topographical maps. Of these categories, only the industrial areas could potentially be classified as urban based on EPA 1986 or Auer 1978. Industrial areas can be easily identified in most cases by the characteristics shown in Figure 6.0-1. For this simplified procedure, white areas that have an industrial classification will be treated as urban areas.

Figure 6.0-1
Supplementary Publication Symbols



117 **Single track**
Line weight .005". Tie weight .003", length .04", spaced .20" center to center.

118 **Single track abandoned**
Same as existing track with space .02", dash .18". Label.

119 **Single track under construction**
Same as existing track with space .02", dash .36". Label UNDER CONSTRUCTION.

120 **Multiple main line track**
Overall width .017". Line weight .003". Tie length .052", spaced .20" center to center. If more than two tracks label, with double cross tie at point of change. Double cross tie .017" overall width.

121 **Multiple track abandoned**
Same as existing track with space .02", dash .18". Label ABANDONED.

122 **Multiple track under construction**
Same as existing track with space .02", dash .36". Label UNDER CONSTRUCTION.

123 **Juxtaposition**
Alternate ties, spaced .20" center to center. Minimum space between tracks .011". Line weight for single tracks .005", multiple tracks .003".

124 **Railroad in street**
Ties spaced .20" center to center. Label if narrow gage. Tie weight .003".

125 **Yards**
Line weight .003". Space between tracks .011". Ties spaced .20" center to center, maximum length to touch 6 tracks.

126 **Sidings**
Line weight .003". Scribe to scale with minimum space between tracks .011". Ties spaced .20" center to center, length .04" for single track.

176 **Large buildings**
Outline weight .003". When width exceeds .06", hatch at 45° angle to building in NE direction, lines .002" spaced .02" center to center.

178 **Sewage disposal or filtration plant**
Line weight .003". See symbol 700 for blue hatching. Label.

196 **Tanks: oil, gas, water, etc.**
Circle .03" minimum, 10" maximum. Label as to content.

197 **Tanks: oil, gas, water, etc.**
Exceeding 10" diameter. Outline weight .003". Hatch SW-NE with .002" lines spaced .02" center to center. Label as to content.

Section 7.0—Statistical Methodology for Bevill Residue Determinations

This section describes the statistical comparison of waste-derived residue to normal residue for use in determining eligibility for the Bevill exemption under 40 CFR 266.112.

7.1 Comparison of Waste-Derived Residue to Normal Residue

To be eligible for the Bevill exclusion from the definition of hazardous waste under 40 CFR 266.112(b)(1), waste-derived residue must not contain Appendix VIII, Part 261, constituents that could reasonably be attributable to the hazardous waste (toxic constituents) at concentrations significantly higher than in residue generated without burning or processing hazardous waste (normal residue). Concentrations of toxic constituents in normal residue are determined based on analysis of a minimum of 10 samples representing a minimum of 10 days of operation. The statistically-derived concentrations in normal residue are determined as the upper tolerance limit (95% confidence with a 95% proportion of the sample distribution) of the normal residue concentrations. The upper tolerance limit is to be determined as described in Section 7.2 below. If changes in raw materials or fuels could lower the statistically-derived concentrations of toxic constituents of concern, the statistically-derived baseline must be re-established for any such mode of operation with the new raw material or fuel.

Concentrations of toxic constituents in waste-derived residue are determined based on the analysis of one or more samples collected over a compositing period of not more than 24 hours. Mulitple samples of the waste-derived residue may be analyzed or subsamples may be composited for analysis, provided that the sampling period does not exceed 24 hours. If more than one sample is analyzed to characterize the waste-derived residue generated over a 24-hour period, the arithmetic mean of the concentrations must be used as the waste-derived concentration for each constituent.

The concentration of a toxic constituent in the waste-derived residue is not considered to be significantly higher than in the normal residue (i.e., the residue passes the Bevill test for that constituent) if the concentration in the waste-derived residue does not exceed the statistically-derived concentration.

7.2 Calculation of the Upper Tolerance Limit

The 95% confidence with 95% proportion of the sample distribution (upper tolerance limit) is calculated for a set of values assuming that the values are normally distributed. The upper tolerance limit is a one-sided calculation and is an appropriate statistical test for cases in which a single value (the waste-derived residue concentration) is compared to the distribution of a range of values (the minimum of 10 measurements of normal residue concentrations). The upper tolerance limit value is determined as follows:

$UTL = X + (K)(S)$

where X = mean of the normal residue concentrations, $X = X_i/n$,

K = coefficient for sample size n, 95% confidence and 95% proportion.,

S = standard deviation of the normal residue concentrations,

$S = (\Sigma (X_i - X)^2/(n - 1))^{0.5}$, and

n = sample size.

The values of K at the 95% confidence and 95% proportion, and sample size n are given in Table 7.0-1.

For example, a normal residue test results in 10 samples with the following analytical results for toxic constituent A:

Sample No.	Concentration of constituent A (ppm)
1	10
2	10
3	15
4	10
5	7
6	12
7	10
8	16
9	15
10	10

The mean and the standard deviation of these measurements, calculated using the above equations, are 11.5 and 2.9, respectively. Assuming that the values are normally distributed, the upper tolerance limit (UTL) is given by:

$UTL = 11.5 + (2.911)(2.9) = 19.9$ ppm

This, if the concentration of constituent A in the waste-derived residue is below 19.9 ppm, then the waste-derived residue is eligible for the Bevill exclusion for constituent A.

7.3 Normal Distribution Assumption

As noted in Section 7.2 above, this statistical approach (use of the upper tolerance limit) for calculation of the concentration in normal residue is based on the assumption that the concentration data are distributed normally. The Agency is aware that concentration data of this type may not always be distributed normally, particularly when concentrations are near the detection limits. There are a number of procedures that can be used to test the distribution of a data set. For example, the Shapiro-Wilk test, examination of a histogram or plot of the data on normal probability paper, and examination of the coefficient of skewness are methods that may be applicable, depending on the nature of the data (References 1 and 2).

If the concentration data are not adequately represented by a normal distribution, the data may be transformed to attain a near normal distribution. The Agency has found that concentration data, especially when near detection levels, often exhibit a lognormal distribution. The assumption of a lognormal distribution has been used in various programs at EPA, such as in the Office of Solid Waste Land Disposal Restrictions program for determination of BDAT treatment standards. The transformed data may be tested for normality using the procedures identified above. If the transformed data are better represented by a normal distribution than the untransformed data, the transformed data should be used in determining the upper tolerance limit using the procedures in Section 7.2 above.

In all cases where the owner or operator wishes to use other than an assumption of normally distributed data or believes that use of an alternate statistical approach is appropriate to the specific data set, he/she must provide supporting rationale in the operating record that demonstrates that the data treatment is based upon sound statistical practice.

7.4 *Nondetect Values*

The Agency is developing guidance regarding the treatment of nondetect values (data where the concentration of the constituent being measured is below the lowest concentration for which the analytical method is valid) in carrying out the statistical determination described above. Until the guidance information is available, facilities may present their own approach to the handling of nondetect data points, but must provide supporting rationale in the operating record for consideration by the Director.

TABLE 7.0–1.—K VALUES FOR 95% CONFIDENCE AND 95% PROPORTION

Sample size (n)	K
10	2.911
11	2.815
12	2.736
13	2.670
14	2.614
15	2.566
16	2.523
17	2.486
18	2.458
19	2.423
20	2.396
21	2.371
22	2.350
23	2.329
24	2.303
25	2.292

7.5 *References*

1. Shapiro, S.S. and Wilk, M.B. (1965). "An Analysis of Variance Test for Normality (complete samples)," Biometrika, 52,591–611.

2. Bhattacharyya, G.K. and R.A. Johnson (1977). Statistical Concepts and Methods, John Wiley and Sons, New York.

SECTION 8.0—PROCEDURES FOR DETERMINING DEFAULT VALUES FOR AIR POLLUTION CONTROL SYSTEM REMOVAL EFFICIENCIES

During interim status, owners or operators of boilers and industrial furnaces burning hazardous waste must submit documentation to EPA that certifies that emissions of HCl, Cl_2, metals, and particulate matter (PM) are not likely to exceed allowable emission rates. See certification of precompliance under 40 CFR 266.103(b). This documentation also establishes interim status feed rate and operating limits for the facility. For the initial certification, estimates of emissions and system removal efficiencies (SREs) can be made to establish the operating limits. Subsequently, owners or operators must use emissions testing to demonstrate that emissions do not exceed allowable levels, and to establish operating limits. See 40 CFR 266.103(c). However, initial estimates of emissions for certification of precompliance can be based on estimated or established SREs.

The SRE combines the effect of partitioning of the chorine, metals, or PM and the air pollution control system removal efficiency (APCS RE) for these pollutants. The SRE is defined as:

SRE=(species input—species emitted) / species input

The SRE can be calculated from the partitioning factor (PF) and APCS RE by the following formula:

SRE=1—[(PF/100) X (1—APCS RE/100)]

where:

PF=percentage of the pollutant partitioned to the combustion gas

Estimates of the PF and/or the APCS RE can be based on either EPA's default values or engineering judgement. EPA's 'default values for the APCS RE for metals, HCl, Cl_2, and PM are described in this section. EPA's default values for partitioning of these pollutants are described in section 9.0.

Guidelines for the use of engineering judgement to estimate APCS REs or PFs are described in section 9.4.

8.1 *APCS RE Default Values for Metals*

EPA's default assumptions for APCS RE for metals are shown in Table 8.1-1. The default values in the table are conservative estimates of the removal efficiencies for metals in BIFs, depending on the volatility of the metal and the type of APCS.

The volatility of a metal depends on the temperature, the thermal input, the chlorine content of the waste, and the identity and concentration of the metal. Metals that do not vaporize at combustion zone temperatures are classified as "nonvolatile". Such metals typically enter the APCS in the form of large particles that are removed relatively easily. Metals that vaporize in the combustion zone and condense before entering the APCS are classified as "volatile". Such metals typically enter the APCS in the form of very fine, submicron particles that are rather inefficiently removed in many APCSs. Metals that vaporize in the combustion zone and do not condense before entering the APCS are classified as "very volatile". Such metals enter the APCS in the form of a vapor that is very inefficiently removed in many APCSs.

Typically, BIFs have combustion zone temperatures high enough to vaporize any hazardous metal at concentrations sufficient to exceed risk-based emission limits. For this reason, the default assumption is that there are no nonvolatile metals. Tables 8.1-2 and 8.1-3 are used to determine whether metals are classified as "volatile" or "very volatile" depending on the temperature entering the APCS, the thermal input, and whether the waste is chlorinated or nonchlorinated.

TABLE 8.1-1.—AIR POLLUTION CONTROL SYSTEMS (APCS) AND THEIR CONSERVATIVELY ESTIMATED EFFICIENCIES FOR CONTROLLING TOXIC METALS (%)

APCS	Metal Volatility		
	Nonvolatile	Volatile	Very Volatile
WS	40	30	20
VS-20	80	75	20
VS-60	87	75	40
ESP-1	90	75	0
ESP-2	92	80	0
ESP-4	95	80	0
WESP	90	85	40
FF	90	80	0
SD/FF	97	90	0
DS/FF	95	90	0
IWS	90	87	75

WS=Wet Scrubber including: Sieve Tray Tower, Packed Tower, Bubble Cap Tower
VS-20=Venturi Scrubber, ca. 20–30 in W.G. Δp
VS-60=Venturi Scrubber, ca. >60 in W.G. Δp
ESP-1=Electrostatic Precipitator; 1 stage
ESP-2=Electrostatic Precipitator; 2 stage
ESP-4=Electrostatic Precipitator; 4 stage
IWS=Ionizing Wet Scrubber
DS=Dry Scrubber
FF=Fabric Filter (Baghouse)
SD=Spray Dryer (Wet/Dry Scrubber)
WESP=Wet Electrostatic Precipitator

TABLE 8.1-2.—TEMPERATURE (F) ENTERING APCS ABOVE WHICH METALS ARE CLASSIFIED AS VERY VOLATILE IN COMBUSTION OF NONCHLORINATED WASTES

Metal		Thermal Input (MMBtu/hr)[1]				
Name	Symbol	1	10	100	1000	10000
Arsenic	As	320	280	240	200	160
Cadmium	Cd	1040	940	860	780	720
Chromium	Cr	2000	1760	1580	1420	1380
Beryllium	Be	1680	1440	1240	1080	980
Antimony	Sb	680	600	540	480	420
Barium	Ba	2240	1820	1540	1360	1240
Lead	Pb	1280	1180	1080	1000	920
Mercury	Hg	340	300	260	220	180
Silver	Ag	1820	1640	1480	1340	1220
Thallium	Tl	900	800	700	620	540

[1] Interpolation of thermal input is not allowed. If a BIF fires between two ranges, the APCS temperature under the higher thermal input must be used.

Example: For a BIF firing 10–100 MMBtu/hr, Mercury is considered very volatile at APCS temperatures above 260 F and volatile at APCS temperatures of 260 F and below.

TABLE 8.1-3.—TEMPERATURE (F) ENTERING APCS ABOVE WHICH METALS ARE CLASSIFIED AS VERY VOLATILE IN COMBUSTION OF CHLORINATED WASTES

Metal		Thermal Input (MMBtu/hr)[1]				
Name	Symbol	1	10	100	1000	10000
Arsenic	As	320	280	240	200	160
Cadmium	Cd	1040	940	860	780	720
Chromium	Cr	>140	>140	>140	>140	>140
Beryllium	Be	1680	1440	1240	1080	980
Antimony	Sb	680	600	540	480	420
Barium	Ba	2060	1840	1680	1540	1420
Lead	Pb	>140	>140	>140	>140	>140
Mercury	Hg	340	300	260	220	180
Silver	Ag	1080	940	840	740	660

TABLE 8.1-3.—TEMPERATURE (F) ENTERING APCS ABOVE WHICH METALS ARE CLASSIFIED AS VERY VOLATILE IN COMBUSTION OF CHLORINATED WASTES—Continued

Metal		Thermal Input (MMBtu/hr)[1]				
Name	Symbol	1	10	100	1000	10000
Thallium	Tl	900	800	700	620	540

[1] Interpolation of thermal input is not allowed. If a BIF fires between two ranges, the APCS temperature under the higher thermal input must be used.

Example: For a BIF firing 10–100 MMBtu/hr, Mercury is considered very volatile at APCS temperatures above 260 F and volatile at APCS temperatures of 260 F and below.

A waste is considered chlorinated if chlorine is present in concentrations greater than 0.1 percent by weight. In the EPA guidance document "Guidance for Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators, Volume IV of the Hazardous Waste Incineration Guidance Series,"(1) one percent is used for the chlorinated/nonchlorinated cutoff. However, best engineering judgement, based on examination of pilot-scale data reported by Carroll et al. (2) on the effects of waste chlorine content on metals emissions, suggests that the 1 percent cutoff may not be sufficiently conservative.

Tables 8.1-2 and 8.1-3 were compiled based on equilibrium calculations. Metals are classified as very volatile at all temperatures above the temperature at which the vapor pressure of the metal is greater than 10 percent of the vapor pressure that results in emissions exceeding the most conservative risk-based emissions limits.

8.2 *APCS RE Default Values for HCl and Cl_2*

Default assumptions for APCS RE for HCl in BIFs are shown in Table 8.2-1. This table is identical to the column for other BIFs except that cement kilns have a minimum HCl removal efficiency of 83 percent. Because of the alkaline nature of the raw materials in cement kilns, most of the chlorine is converted to chloride salts. Thus, the minimum APCS RE for HCl for cement kilns is independent of the APCS train.

Removal efficiency of Cl_2 for most types of APCS is generally minimal. Therefore, the default assumption for APCS RE for Cl_2 for all APCSs is 0 percent. This is applicable to all BIFs, including cement kilns.

8.3 *APCS RE Default Values for Ash*

Default assumptions for APCS RE for PM are also shown in Table 8.1-4. These figures are conservative estimates of PM removal efficiencies for different types of APCSs. They are identical to the figures in the Nonvolatile APCS RE column for hazardous metals presented in Table 8.1-1 because the same collection mechanisms and collection efficiencies that apply to nonvolatile metals also apply to PM.

TABLE 8.2-1.—AIR POLLUTION CONTROL SYSTEMS (APCS) AND THEIR CONSERVATIVELY ESTIMATED EFFICIENCIES FOR REMOVING HYDROGEN CHLORIDE (HCL) AND PARTICULATE MATTER (PM) (%)

APCD	HCl		PM
	Cement kilns	Other BIFs	
WS	97	97	40
VS-20	97	97	80
VS-60	98	98	87
ESP-1	83	0	90
ESP-2	83	0	92
ESP-4	83	0	95
WESP	83	70	90
FF	83	0	90
SD/FF	98	98	97
DS/FF	98	98	95
WS/IWS	99	99	95
IWS	99	99	90

WS=Wet Scrubber including: Sieve Tray Tower, Packed Tower, Bubble Cap Tower

PS=Proprietary Wet Scrubber Design (A number of proprietary wet scrubbers have come on the market in recent years that are highly efficient on both particulates and corrosive gases. Two such units are offered by Calvert Environmental Equipment Co. and by Hydro-Sonic Systems, Inc.).

VS-20=Venturi Scrubber, ca. 20-30 in W.G. Δp

VS-60=Venturi Scrubber, ca. >60 in W.G. Δp

ESP-1=Electrostatic Precipitator; 1 stage

ESP-2=Electrostatic Precipitator; 2 stage

ESP-4=Electrostatic Precipitator; 4 stage

IWS=Ionizing Wet Scrubber

DS=Dry Scrubber

FF=Fabric Filter (Baghouse)

SD=Spray Dryer (Wet/Dry Scrubber)

8.4 *References*

1. U.S. Environmental Protection Agency. "Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators," Office of Solid Waste, Washington, DC, August 1989.

2. Carroll, G.J., R.C. Thurnau, R.E. Maurnighan, L.R. Waterland, J.W. Lee, and D.J. Fournier. The Partitioning of Metals in Rotary Kiln Incineration. Proceedings of the Third International Conference on New Frontiers for Hazardous Waste Management. NTIS Document No. EPA/600/9-89/072, p. 555 (1989).

SECTION 9.0—PROCEDURES FOR DETERMINING DEFAULT VALUES FOR PARTITIONING OF METALS, ASH, AND TOTAL CHLORIDE/CHLORINE

Pollutant partitioning factor estimates can come from two sources: default assumptions or engineering judgement. EPA's default assumptions are discussed below for metals, HCl, Cl_2, and PM. The default assumptions are used to conservatively predict the partitioning factor for several types of BIFs. Engineering judgement-based partitioning factor estimates are discussed in section 9.4.

9.1 *Partitioning Default Value for Metals*

To be conservative, the Agency is assuming that 100 percent of each metal in each feed stream is partitioned to the combustion gas. Owners/operators may use this default value or a supportable, site-specific value developed following the general guidelines provided in section 9.4.

9.2 *Special Procedures for Chlorine, HCl, and Cl_2*

The Agency has established the special procedures presented below for chlorine because the emission limits are based on the pollutants HCl and Cl2 formed from chlorine fed to the combustor. Therefore, the owner/operator must estimate the controlled emission rate of both HCl and Cl_2 and show that they do not exceed allowable levels.

1. The default partitioning value for the fraction of chlorine in the total feed streams that is partitioned to combustion gas is 100 percent. Owners/operators may use this default value or a supportable, site-specific value developed following the general guidelines provided in section 9.4.

2. To determine the partitioning of chlorine in the combustion gas to HCl versus Cl_2, either use the default values below or use supportable site-specific values developed following the general guidelines provided in section 9.4.

- For BIFs excluding halogen acid furnaces (HAFs), with a total feed stream chlorine/hydrogen ratio ≤0.95, the default partitioning factor is 20 percent Cl_2, 80 percent HCl.
- For HAFs and for BIFs with a total feed stream chlorine/hydrogen ratio >0.95, the default partitioning factor is 100 percent Cl_2.

3. To determine the uncontrolled (i.e., prior to acid gas APCS) emission rate of HCl and Cl_2, multiply the feed rate of chlorine times the partitioning factor for each pollutant. Then, for HCl, convert the chlorine emission rate to HCl by multiplying it by the ratio of the molecular weight of HCl to the molecular weight of Cl (i.e., 36.5/35.5). No conversion is needed for Cl_2.

9.3 *Special Procedures for Ash*

This section: (1) Explains why ash feed rate limits are not applicable to cement and light-weight aggregate kilns; (2) presents the default partitioning values for ash; and (3) explains how to convert the 0.08 gr/dscf, corrected to 7% O_2, PM emission limit to a PM emission rate.

Waiver for Cement and Light-Weight Aggregate Kilns. For cement kilns and light-weight aggregate kilns, raw material feed streams contain the vast majority of the ash input, and a significant amount of the ash in the feed stream is entrained into the kiln exhaust gas. For these devices, the ash content of the hazardous waste stream is expected to have a negligible effect on total ash emissions. For this reason, there is no ash feed rate compliance limit for cement kilns or light-weight aggregate kilns. Nonetheless, cement kilns and light-weight aggregate kilns are required to initially certify that PM emissions are not likely to exceed the PM limit, and subsequently, certify through compliance testing that the PM limit is not exceeded.

Default Partitioning Value for Ash. The default assumption for partitioning of ash depends on the feed stream firing system. There are two methods by which materials may be fired into BIFs: Suspension-firing and bed-firing.

The suspension category includes atomized and lanced pumpable liquids and suspension-fired pulverized solids. The default partitioning assumption for materials fired by these systems is that 100 percent of the ash partitions to the combustion gas.

The bed-fired category consists principally of stoker boilers and raw materials (and in some cases containerized hazardous waste) fed into cement and light-weight aggregate kilns. The default partitioning assumption for materials fired on a bed is that 5 percent of the ash partitions to the combustion gas.

Converting the PM Concentration-Based Standard to a PM Mass Emission Rate. The emission limit for BIFs is 0.08 gr/dscf, corrected to 7% O_2, unless a more stringent standard applies [e.g., a New Source Performance Standard (NSPS) or a State standard implemented under the State Implementation Plan (SIP)]. To convert the 0.08 gr/dscf standard to a PM mass emission rate:

1. Determine the flue gas O_2 concentration (percent by volume, dry) and flue gas flow rate (dry standard cubic feet per minute); and

2. Calculate the allowable PM mass emission rate by multiplying the concentration-

based PM emission standard times the flue gas flow rate times a dilution correction factor equal to [(21–O_2 concentration from step 1)/(21–7)].

9.4 *Use of Engineering Judgement To Estimate Partitioning and APCS RE Values*

Engineering judgement may be used in place of EPA's conservative default assumptions to estimate partitioning and APCS RE values provided that the engineering judgement is defensible and properly documented. To properly document engineering judgement, the owner/operator must keep a written record of all assumptions and calculations necessary to justify the APCS RE used. The owner/operator must provide this record to the Director upon request and must be prepared to defend the assumptions and calculations used.

If the engineering judgement is based on emissions testing, the testing will often document the emission rate of a pollutant relative to the feed rate of that pollutant rather than the partitioning factor or APCS RE.

Examples of situations where the use of engineering judgement may be supportable to estimate a partitioning factor, APCS RE, or SRE include:

- Using emissions testing data from the facility to support an SRE, even though the testing may not meet full QA/QC procedures (e.g., triplicate test runs). The closer the test results conform with full QA/QC procedures and the closer the operating conditions during the test conform with the established operating conditions for the facility, the more supportable the engineering judgement will be.
- Applying emissions testing data documenting an SRE for one metal, including nonhazardous surrogate metals to another less volatile metal.
- Applying emissions testing data documenting an SRE from one facility to a similar facility.
- Using APCS vendor guarantees of removal efficiency.

9.5 *Restrictions on Use of Test Data*

The measurement of an SRE or an APCS RE may be limited by the detection limits of the measurement technique. If the emission of a pollutant is undetectable, then the calculation of SRE or APCS RE should be based on the lower limit of detectability. An SRE or APCS RE of 100 percent is not acceptable.

Further, mass balance data of facility inputs, emissions, and products/residues may not be used to support a partitioning factor, given the inherent uncertainties of such procedures. Partitioning factors other than the default values may be supported based on engineering judgement, considering, for example, process chemistry. Emissions test data may be used to support an engineering judgement-based SRE, which includes both partitioning and APCS RE.

9.5 *References*

1. Barton, R.G., W.D. Clark, and W.R. Seeker. (1990) "Fate of Metals in Waste Combustion Systems". Combustion Science and Technology. 74, 1–6, p. 327

SECTION 10.0—ALTERNATIVE METHODOLOGY FOR IMPLEMENTING METALS CONTROLS

10.1 *Applicability*

This method for controlling metals emissions applies to cement kilns and other industrial furnaces operating under interim status that recycle emission control residue back into the furnace.

10.2 *Introduction*

Under this method, cement kilns and other industrial furnaces that recycle emission control residue back into the furnace must comply with a kiln dust concentration limit (i.e., a collected particulate matter (PM) limit) for each metal, as well as limits on the maximum feedrates of each of the metals in: (1) pumpable hazardous waste; and (2) all hazardous waste.

The following subsections describe how this method for controlling metals emissions is to be implemented:

- Subsection 10.3 discusses the basis of the method and the assumptions upon which it is founded;
- Subsection 10.4 provides an overview of the implementation of the method;
- Subsection 10.5 is a step-by-step procedure for implementation of the method;
- Subsection 10.6 describes the compliance procedures for this method; and
- Appendix A describes the statistical calculations and tests to be used in the method.

10.3 *Basis*

The viability of this method depends on three fundamental assumptions:

(1) Variations in the ratio of the metal concentration in the emitted particulate to the metal concentration in the collected kiln dust (referred to as the enrichment factor or EF) for any given metal at any given facility will fall within a normal distribution that can be experimentally determined.

(2) The metal concentrations in the collected kiln dust can be accurately and representatively measured (using procedures specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW–846), incorporated by reference in 40 CFR 260.11).

(3) The facility will remain in compliance with the applicable particulate matter (PM) emission standard.

Given these assumptions, metal emissions can be related to the measured concentrations in the collected kiln dust by the following equation:

$$ME\left(\frac{\text{lb Emitted Metal}}{\text{hr}}\right)=$$

$$PME\left(\frac{\text{lb PM}}{\text{hr}}\right)DMC\left(\frac{\text{lb Dust Metal}}{\text{lb Dust}}\right)EF\left(\frac{\text{lb Emitted Metal / lb PM}}{\text{lb Dust Metal / lb Dust}}\right) \qquad (1)$$

Where:

ME is the metal emitted;

PME is the particulate matter emitted;

DMC is the metal concentration in the collected kiln dust; and

EF is the enrichment factor, which is the ratio of the metal concentration in the emitted particulate matter to the metal concentration in the collected kiln dust.

This equation can be rearranged to calculate a maximum allowable dust metal concentration limit (DMCL) by assuming worst-case conditions that: metal emissions are at the Tier III (or Tier II) limit (see 40 CFR 266.106), and that particulate emissions are at the particulate matter limit (PML):

$$DMCL\left(\frac{\text{lb Dust Metal}}{\text{lb Dust}}\right)=\frac{\text{Tier III Limit}\left(\frac{\text{lb Emitted Metal}}{\text{hr}}\right)}{PML\left(\frac{\text{lb PM}}{\text{hr}}\right)EF\left(\frac{\text{lb Emitted Metal / lb PM}}{\text{lb Dust Metal / lb Dust}}\right)} \qquad (2)$$

The enrichment factor used in the above equation must be determined experimentally from a minimum of 10 tests in which metal concentrations are measured in kiln dust and stack samples taken simultaneously. This approach provides a range of enrichment factors that can be inserted into a statistical distribution (t-distribution) to determine $EF_{95\bullet}$ and $EF_{99\bullet}$. $EF_{95\bullet}$ is the value at which there is a 95% confidence level that the enrichment factor is below this value at any given time. Similarly, $EF_{99\bullet}$ is the value at which there is a 99% confidence level that the enrichment factor is below this value at any given time. $EF_{95\bullet}$ is used to calculate the "violation" dust metal concentration limit ($DMCL_v$):

$$DMCL_v\left(\frac{\text{lb Dust Metal}}{\text{lb Dust}}\right)=\frac{\text{Tier III Limit}\left(\frac{\text{lb Emitted Metal}}{\text{hr}}\right)}{PML\left(\frac{\text{lb PM}}{\text{hr}}\right)EF_{95\bullet}\left(\frac{\text{lb Emitted Metal / lb PM}}{\text{lb Dust Metal / lb Dust}}\right)} \qquad (3)$$

If the kiln dust metal concentration is just above this "violation" limit, and the PM emissions are at the PM emissions limit, there is a 5% chance that the metal emissions are above the Tier III limit. In such a case, the facility would be in violation of the metals standard.

To provide a margin of safety, a second, more conservative kiln dust metal concentration limit is also used. This "conservative" dust metal concentration limit ($DMCL_c$) is calculated using a "safe" enrichment factor (SEF). If $EF_{99\bullet}$ is greater than two times the value of $EF_{95\bullet}$, the "safe" enrichment factor can be calculated using Equation 4a:

$SEF \geq 2\ EF_{95\bullet}$ (4a)Q02

If $EF_{99\bullet}$ is not greater than two times the value of $EF_{95\bullet}$, the "safe" enrichment factor can be calculated using Equation 4b:

$SEF \geq EF_{99\bullet}$ (4b)

In cases where the enrichment factor cannot be determined because the kiln dust metal concentration is nondetectable, the "safe" enrichment factor is as follows:

$SEF=100$ (4c)

For all cases, the "conservative" dust metal concentration limit is calculated using the following equation:

$$DMCL_c\left(\frac{1b\ Dust\ Metal}{1b\ Dust}\right)=\frac{Tier\ III\ Limit\left(\frac{1b\ Emitted\ Metal}{hr}\right)}{PML\left(\frac{1b\ PM}{hr}\right)SEF\left(\frac{1b\ Emitted\ Metal/1b\ PM}{1b\ Dust\ Metal/1b\ Dust}\right)} \quad (5)$$

If the kiln dust metal concentration at a facility is just above the "conservative" limit based on that "safe" enrichment factor provided in Equation 4a, and the PM emissions are at the PM emissions limit, there is a 5% chance that the metal emissions are above one-half the Tier III limit. If the kiln dust metal concentration at the facility is just above the "conservative" limit based on the "safe" enrichment factor provided in Equation 4b, and the PM emissions are at the PM emissions limit, there is a 1% chance that the metal emissions are above the Tier III limit. In either case, the facility would be unacceptably close to a violation. If this situation occurs more than 5% of the time, the facility would be required to rerun the series of 10 tests to determine the enrichment factor. To avoid this expense, the facility would be advised to reduce its metals feedrates or to take other appropriate measures to maintain its kiln dust metal concentrations in compliance with the "conservative" dust metal concentration limits.

In cases where the enrichment factor cannot be determined because the kiln dust metal concentration is nondetectable, and thus no $EF_{95<}$ exists, the "violation" dust metal concentration limit is set at ten times the "conservative" limit:

$DMCL_v=10\times DMCL_c$ (6)

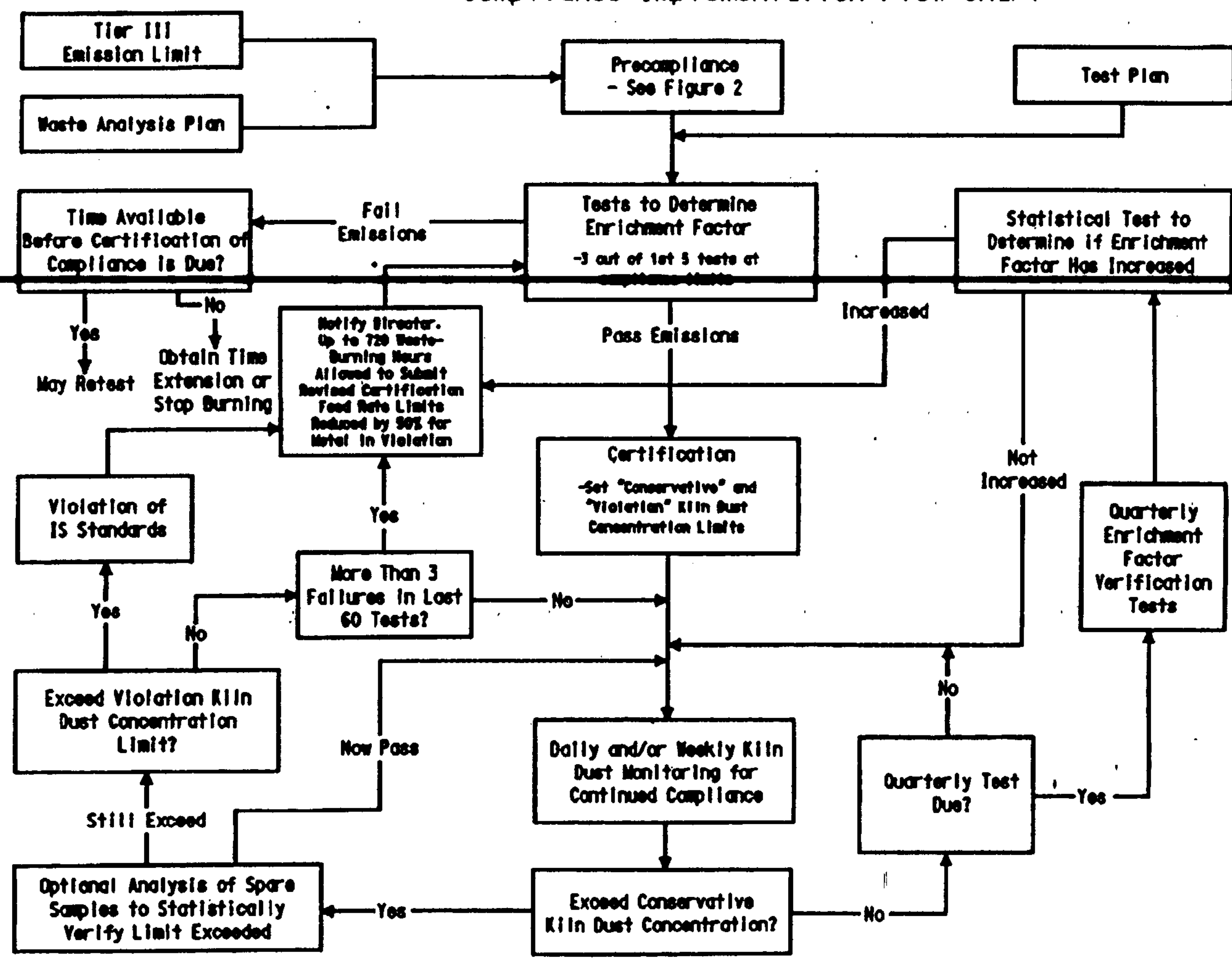
10.4 *Overview*

The flowchart for implementing the method is shown in Figure 10.4-1. The general procedure is as follows:

- Follow the certification of precompliance procedures described in subsection 10.6 (to comply with 40 CFR 266.103(b)).
- For each metal of concern, perform a series of tests to establish the relationship (enrichment factor) between the concentration of emitted metal and the metal concentration in the collected kiln dust.
- Use the demonstrated enrichment factor, in combination with the Tier III (or Tier II) metal emission limit and the most stringent applicable particulate emission limit, to calculate the "violation" and "conservative" dust metal concentration limits. Include this information with the certification of compliance under 40 CFR 266.103(c).

Figure 10.4-1

Compliance Implementation Flow Chart



• Perform daily and/or weekly monitoring of the cement kiln dust metal concentration to ensure (with appropriate QA/QC) that the metal concentration does not exceed either limit.

—If the cement kiln dust metal concentration exceeds the "conservative" limit more than 5% of the time (i.e., more than three failures in last 60 tests), the series of tests to determine the enrichment factor must be repeated.

—If the cement kiln dust metal concentration exceeds the "violation" limit, a violation has occurred.

• Perform quarterly tests to verify that the enrichment factor has not increased significantly. If the enrichment factor has increased, the series of tests to determine the enrichment factor must be repeated.

10.5 *Implementation Procedures*

A step-by-step description for implementing the method is provided below:

(1) Prepare initial limits and test plans.

• Determine the Tier III metal emission limit. The Tier II metal emission limit may also be used (see 40 CFR 266.106).

• Determine the applicable PM emission standard. This standard is the most stringent particulate emission standard that applies to the facility. A facility may elect to restrict itself to an even more stringent self-imposed PM emission standard, particularly if the facility finds that it is easier to control particulate emissions than to reduce the kiln dust concentration of a certain metal (i.e., lead).

• Determine which metals need to be monitored (i.e., all hazardous metals for which Tier III emission limits are lower than PM emission limits—assuming PM is pure metal).

• Follow the compliance procedures described in Subsection 10.6.

• Follow the guidelines described in SW-846 for preparing test plans and waste analysis plans for the following tests:

—Compliance tests to determine limits on metal feedrates in pumpable hazardous wastes and in all hazardous wastes (as well as to determine other compliance parameters);

—Initial tests to determine enrichment factors;

—Quarterly tests to verify enrichment factors;

—Analysis of hazardous waste feedstreams; and

—Daily and/or weekly monitoring of kiln dust for continuing compliance.

(2) Conduct tests to determine the enrichment factor.

• These tests must be conducted within a 14-day period. No more than two tests may be conducted in any single day. If the tests are not completed within a 14-day period, they must be repeated.

• Simultaneous stack samples and kiln dust samples must be taken.

—Stack sampling must be conducted with the multiple metals train according to procedures provided in section 10.3 of this Methods Manual.

—Kiln dust sampling must be conducted as follows:

—Follow the sampling and analytical procedures described in SW-846 and the waste analysis plan as they pertain to the condition and accessibility of the dust.

—Samples should be representative of the last ESP or Fabric Filter in the APCS series.

• The feedrates of hazardous metals in all pumpable hazardous waste streams and in all hazardous waste streams must be monitored during these tests. It is recommended (but not required) that the feedrates of hazardous metals in all feedstreams also be monitored.

• At least ten single (noncomposited) runs are required during the tests.

—The facility must follow a normal schedule of kiln dust recharging for all of the tests.

—Three of the first five tests must be compliance tests in conformance with 40 CFR 266.103(c); i.e., they must be used to determine maximum allowable feedrates of metals in pumpable hazardous wastes, and in all hazardous wastes, as well as to determine other compliance limits (see 40 CFR 266.103(c)(1)).

—The remainder of the tests need not be conducted under full compliance test conditions; however, the facility must operate at its compliance test production rate, and it must burn hazardous waste during these tests such that the feedrate of each metal for pumpable and total hazardous wastes is at least 25% of the feedrate during compliance testing. If these criteria, and those discussed below, are not met for any parameter during a test, then either the test is not valid for determining enrichment factors under this method, or the compliance limits for that parameter must be established based on these test conditions rather than on the compliance test conditions.

• Verify that compliance emission limits are not exceeded.

—Metal emissions must not exceed Tier III (or Tier II) limits.

—PM emissions must not exceed the most stringent of applicable PM standards (or an optional self-imposed particulate standard).

• The facility must generate normal, marketable product using normal raw materials and fuels under normal operating conditions (for parameters other than those specified under this method) when these tests are conducted.

• Chromium must be treated as a special case:

—The enrichment factor for total chromium is calculated in the same way as the enrichment factor for other metals (i.e., the enrichment factor is the ratio of the concentration of total chromium in the emitted particulate matter to the concentration of total chromium in the collected kiln dust).

—The enrichment factor for hexavalent chromium (if measured) is defined as the ratio of the concentration of hexavalent chromium in the emitted particulate matter to the concentration of total chromium in the collected kiln dust.

(3) Use the enrichment factors measured in Step 2 to determine $EF_{95\%}$, $EF_{99\%}$ and SEF.

• Calculate $EF_{95\%}$ and $EF_{99\%}$ according to the t-distribution as described in Appendix A

• Calculate SEF by

—Equation 4a if $EF_{95\%}$ is determinable and if $EF_{99\%}$ is greater than two times $EF_{95\%}$.

—Equation 4b if $EF_{95\%}$ is determinable and if $EF_{99\%}$ is not greater than two times $EF_{95\%}$.

—Equation 4c if $EF_{95\%}$ is not determinable.

The facility may choose to set an even more conservative SEF to give itself a larger margin of safety between the point where corrective action is necessary and the point where a violation occurs.

(4) Prepare certification of compliance.

• Calculate the "conservative" dust metal concentration limit ($DMCL_c$) using Equation 5.

—Chromium is treated as a special case. The "conservative" kiln dust chromium concentration limit is set for total chromium, not for hexavalent chromium. The limit for total chromium must be calculated using the Tier III (or Tier II) metal limit for hexavalent chromium.

—If the stack samples described in Step 2 were analyzed for hexavalent chromium, the SEF based on the hexavalent chromium enrichment factors (as defined in Step 2) must be used in this calculation.

—If the stack samples were not analyzed for hexavalent chromium, then the SEF based on the total chromium enrichment factor must be used in this calculation.

• Calculate the "violation" dust metal concentration limit ($DMCL_v$) using Equation 3 if $EF_{95\%}$ is determinable, or using Equation 6 if $EF_{95\%}$ is not determinable.

—Chromium is treated as a special case. The "violation" kiln dust chromium concentration limit is set for total chromium, not for hexavalent chromium. The limit for total chromium must be calculated using the Tier III (or Tier II) metal limit for hexavalent chromium.

—If the stack samples taken in Step 2 were analyzed for hexavalent chromium, the $EF_{95\%}$ based on the hexavalent chromium enrichment factor (as defined in Step 2) should be used in this calculation.

—If the stack samples were not analyzed for hexavalent chromium, the $EF_{95\%}$ based on the total chromium enrichment factor must be used in this calculation.

• Submit certification of compliance.

• Steps 2–4 must be repeated for recertification, which is required once every 3 years (see § 266.103(d)).

(5) Monitor metal concentrations in kiln dust for continuing compliance, and maintain compliance with all compliance limits for the duration of interim status.

• Metals to be monitored during compliance testing are classified as either "critical" or "noncritical" metals.

—All metals must initially be classified as "critical" metals and be monitored on a daily basis.

—A "critical" metal may be reclassified as a "noncritical" metal if its concentration in the kiln dust remains below 10% of its "conservative" kiln dust metal concentration limit for 30 consecutive daily samples. "Noncritical" metals must be monitored on a weekly basis.

—A "noncritical" metal must be reclassified as a "critical" metal if its concentration in the kiln dust is above 10% of its "conservative" kiln dust metal concentration limit for any single daily or weekly sample.

• Noncompliance with the sampling and analysis schedule prescribed by this method is a violation of the metals controls under § 266.103.

• Follow the sampling, compositing, and analytical procedures described in this method and in SW–846 as they pertain to the condition and accessibility of the kiln dust.

• Follow the same procedures and sample at the same locations as were used for kiln dust samples collected to determine the enrichment factors (as discussed in Step 2).

• Samples must be collected at least once every 8 hours, and a daily composite must be prepared according to SW–846 procedures.

—At least one composite sample is required. This sample is referred to as the "required" sample.

—For QA/QC purposes, a facility may elect to collect two or more additional samples. These samples are referred to as the "spare" samples. These additional samples must be collected over the same time period and according to the same procedures as those used for the "required" sample.

—Samples for "critical" metals must be daily composites.

—Samples for "noncritical" metals must be weekly composites. These samples can be composites of the original 8-hour samples, or they can be composites of daily composite samples.

• Analyze the "required" sample to determine the concentration of each metal.

—This analysis must be completed within 48 hours of the close of the sampling period. Failure to meet this schedule is a violation of the metals standards of § 266.103.

• If the "conservative" kiln dust metal concentration limit is exceeded for any metal, refer to Step 8.

• If the "conservative" kiln dust metal concentration limit is not exceeded, continue with the daily or weekly monitoring (Step 5) for the duration of interim status.

• Conduct quarterly enrichment factor verification tests, as described in Step 6.

(6) Conduct quarterly enrichment factor verification tests.

• After certification of compliance with the metals standards, a facility must conduct quarterly enrichment factor verification tests every three months for the duration of interim status. The first quarterly test must be completed within three months of certification (or recertification). Each subsequent quarterly test must be completed within three months of the preceding quarterly test. Failure to meet this schedule is a violation.

• Simultaneous stack samples and kiln dust samples must be collected.

• Follow the same procedures and sample at the same locations as were used for kiln dust samples and stack samples collected to determine the enrichment factors (as discussed in Step 2).

• At least three single (noncomposited) runs are required. These tests need not be conducted under the operating conditions of the initial compliance test; however, the facility must operate under the following conditions:

—It must operate at compliance test production rate.

—It must burn hazardous waste during the test, and for the 2-day period immediately preceding the test, such that the feedrate of each metal for pumpable and total hazardous wastes consist of at least 25% of the operating limits established during the compliance test.

—It must remain in compliance with all compliance parameters (see § 266.103(c)(1)).

—It must follow a normal schedule of kiln dust recharging.

—It must generate normal marketable product from normal raw materials during the tests.

(7) Conduct a statistical test to determine if the enrichment factors measured in the quarterly verification tests have increased significantly from the enrichment factors determined in the tests conducted in Step 2. The enrichment factors have increased significantly if all three of the following criteria are met:

• By applying the t-test described in appendix A, it is determined that the enrichment factors measured in the quarterly tests are not taken from the same population as the enrichment factors measured in the Step 2 tests;

• The EF$_{95\%}$ calculated for the combined data sets (i.e., the quarterly test data and the original Step 2 test data) according to the t-distribution (described in appendix A) is more than 10% higher than the EF$_{95\%}$ based on the enrichment factors previously measured in Step 2; and

• The highest measured kiln dust metal concentration recorded in the previous quarter is more than 10% of the "violation" kiln dust concentration limit that would be calculated from the combined EF$_{95\%}$.

If the enrichment factors have increased significantly, the tests to determine the enrichment factors must be repeated (refer to Step 11). If the enrichment factors have not increased significantly, continue to use the kiln dust metal concentration limits based on the enrichment factors previously measured in Step 2, and continue with the daily and/or weekly monitoring described in Step 5.

(8) If the "conservative" kiln dust metal concentration limit was exceeded for any metal in any single analysis of the "required" kiln dust sample, the "spare" samples corresponding to the same period may be analyzed to determine if the exceedance was due to a sampling or analysis error.

• If no "spare" samples were taken, refer to Step 9.

• If the average of all the samples for a given day (or week, as applicable) (including the "required" sample and the "spare" samples) does not exceed the "conservative" kiln dust metal concentration limit, no corrective measures are necessary; continue with the daily and/or weekly monitoring as described in Step 5.

• If the average of all the samples for a given day (or week, as applicable) exceeds the "conservative" kiln dust metal concentration limit, but the average of the "spare" samples is below the "conservative" kiln dust metal concentration limit, apply the Q-test, described in appendix A, to determine whether the "required" sample concentration can be judged as an outlier.

—If the "required" sample concentration is judged an outlier, no corrective measures are necessary; continue with the daily and/or weekly monitoring described in Step 5.

—If the "required" sample concentration is not judged an outlier, refer to Step 9.

(9) Determine if the "violation" kiln dust metal concentration has been exceeded based on either the average of all the samples collected during the 24-hour period in question, or if discarding an outlier can be statistically justified by the Q-test described in

appendix A, on the average of the remaining samples.

• If the "violation" kiln dust metal concentration limit has been exceeded, a violation of the metals controls under §266.103(c) has occurred. Notify the Director that a violation has occurred. Hazardous waste may be burned for testing purposes for up to 720 operating hours to support a revised certification of compliance. Note that the Director may grant an extension of the hours of hazardous waste burning under §266.103(c)(7) if additional burning time is needed to support a revised certification for reasons beyond the control of the owner or operator. Until a revised certification of compliance is submitted to the Director, the feedrate of the metals in violation in total and pumpable hazardous waste feeds is limited to 50% of the previous compliance test limits.

• If the "violation" kiln dust metal concentration has not been exceeded:

—If the exceedance occurred in a daily composite sample, refer to Step 10.

—If the exceedance occurred in a weekly composite sample, refer to Step 11.

(10) Determine if the "conservative" kiln dust metal concentration limit has been exceeded more than three times in the last 60 days.

• If not, log this exceedance and continue with the daily and/or weekly monitoring (Step 5).

• If so, the tests to determine the enrichment factors must be repeated (refer to Step 11).

• This determination is made separately for each metal. For example,

—Three exceedances for each of the ten hazardous metals are allowed within any 60-day period.

—Four exceedances of any single metal in any 60-day period is not allowed.

• This determination should be made daily, beginning on the first day of daily monitoring. For example, if four exceedances of any single metal occur in the first four days of daily monitoring, do not wait until the end of the 60-day period; refer immediately to Step 11.

(11) The tests to determine the enrichment factor must be repeated if: (1) More than three exceedances of the "conservative" kiln dust metal concentration limit occur within any 60 consecutive daily samples; (2) an excursion of the "conservative" kiln dust metal concentration limit occurs in any weekly sample; or (3) a quarterly test indicates that the enrichment factors have increased significantly.

• The facility must notify the Director if these tests must be repeated.

• The facility has up to 720 hazardous-waste-burning hours to redetermine the enrichment factors for the metal or metals in question and to recertify (beginning with a return to Step 2). During this period, the facility must reduce the feed rate of the metal in violation by 50%. If the facility has not completed the recertification process within this period, it must stop burning or obtain an extension. Hazardous waste burning may resume only when the recertification process (ending with Step 4) has been completed.

• Meanwhile, the facility must continue with daily kiln dust metals monitoring (Step 5) and must remain in compliance with the "violation" kiln dust metal concentration limits (Step 9).

10.6 *Precompliance Procedures*

Cement kilns and other industrial furnaces that recycle emission control residue back into the furnace must comply with the same certification schedules and procedures (with the few exceptions described below) that apply to other boilers and industrial furnaces. These schedules and procedures, as set forth in §266.103, require no later than the effective date of the rule, each facility submit a certification which establishes precompliance limits for a number of compliance parameters (see §266.103(b)(3)), and that each facility immediately begin to operate under these limits.

These precompliance limits must ensure that interim status emissions limits for hazardous metals, particulate matter, HCl, and Cl_2 are not likely to be exceeded. Determination of the values of the precompliance limits must be made based on either (1) conservative default assumptions provided in this Methods Manual, or (2) engineering judgement.

The flowchart for implementing the precompliance procedures is shown in Figure 10.6-1. The step-by-step precompliance implementation procedure is described below. The precompliance implementation procedures and numbering scheme are similar to those used for the compliance procedures described in Subsection 10.5.

(1) Prepare initial limits and test plans.

• Determine the Tier III metal emission limit. The Tier II metal emission limit may also be used (see 40 CFR 266.106).

• Determine the applicable PM emission standard. This standard is the most stringent particulate emission standard that applies to the facility. A facility may elect to restrict itself to an even more stringent self-imposed PM emission standard, particularly if the facility finds that it is easier to control particulate emissions than to reduce the kiln dust concentration of a certain metal (i.e., lead).

• Determine which metals need to be monitored (i.e., all hazardous metals for which Tier III emission limits are lower than PM emission limits, assuming PM is pure metal).

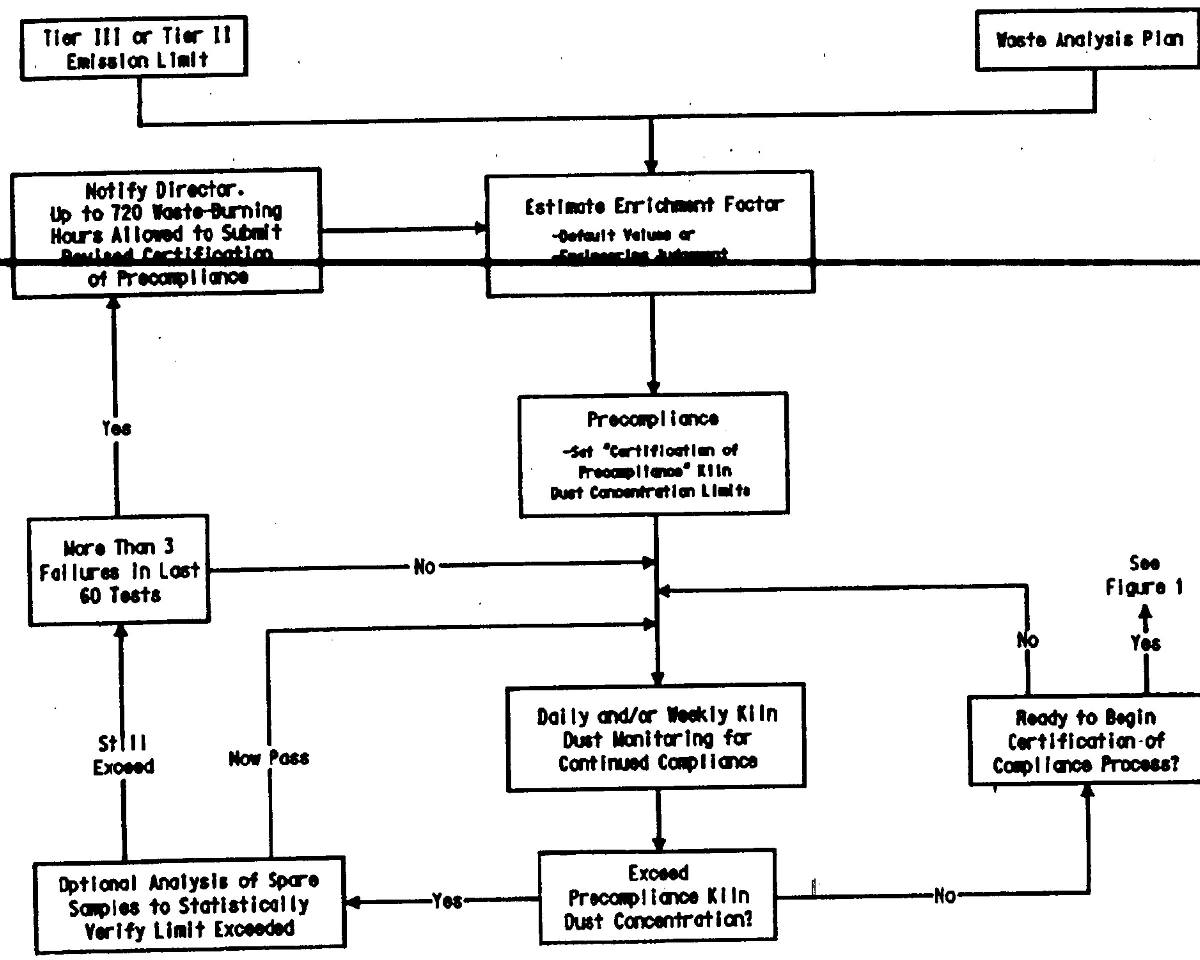
• Follow the procedures described in SW-846 for preparing waste analysis plans for the following tasks:

—Analysis of hazardous waste feedstreams.
—Daily and/or weekly monitoring of kiln dust concentrations for continuing compliance.

(2) Determine the "safe" enrichment factor for precompliance. In this context, the "safe" enrichment factor is a conservatively high estimate of the enrichment factor (the ratio of the emitted metal concentration to the metal concentration in the collected kiln dust). The "safe" enrichment factor must be calculated from either conservative default values, or engineering judgement.

Figure 10.6-1

Precompliance Implementation Flow Chart



• Conservative default values for the "safe" enrichment factor are as follows:

—SEF=10 for all hazardous metals except mercury. SEF=10 for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, silver, and thallium.

—SEF=100 for mercury.

• Engineering judgement may be used in place of conservative default assumptions provided that the engineering judgement is defensible and properly documented. The facility must keep a written record of all assumptions and calculations necessary to justify the SEF. The facility must provide this record to EPA upon request and must be prepared to defend these assumptions and calculations.

Examples of situations where the use of engineering judgement is appropriate include:

—Use of data from precompliance tests;

—Use of data from previous compliance tests; and

—Use of data from similar facilities.

(3) This step does not apply to precompliance procedures.

(4) Prepare certification of precompliance.

• Calculate the "conservative" dust metal concentration limit ($DMCL_c$) using Equation 5.

• Submit certification of precompliance. This certification must include precompliance limits for all compliance parameters that apply to other boilers and industrial furnaces (i.e., those that do not recycle emission control residue back into the furnace) as listed in §266.103(b)(3), except that it is not necessary to set precompliance limits on maximum feedrate of each hazardous metal in all combined feedstreams.

• Furnaces that recycle collected PM back into the furnace (and that elect to comply with this method (see §266.103(c)(3)(ii)) are subject to a special precompliance parameter, however. They must establish precompliance limits on the maximum concentration of each hazardous metal in collected kiln dust (which must be set according to the procedures described above).

(5) Monitor metal concentration in kiln dust for continuing compliance, and maintain compliance with all precompliance limits until certification of compliance has been submitted.

• Metals to be monitored during precompliance testing are classified as either "critical" or "noncritical" metals.

—All metals must initially be classified as "critical" metals and be monitored on a daily basis.

—A "critical" metal may be reclassified as a "noncritical" metal if its concentration in the kiln dust remains below 10% of its "conservative" kiln dust metal concentration limit for 30 consecutive daily samples. "Noncritical" metals must be monitored on a weekly basis, at a minimum.

—A "noncritical" metal must be reclassified as a "critical" metal if its concentration in the kiln dust is above 10% of its "conservative" kiln dust metal concentration limit for any single daily or weekly sample.

• It is a violation if the facility fails to analyze the kiln dust for any "critical" metal on any single day or for any "noncritical" metal during any single week, when hazardous waste is burned.

• Follow the sampling, compositing, and analytical procedures described in this method and in SW-846 as they pertain to the condition and accessibility of the kiln dust.

• Samples must be collected at least once every 8 hours, and a daily composite prepared according to SW-846 procedures.

—At least one composite sample is required. This sample is referred to as the "required" sample.

—For QA/QC purposes, a facility may elect to collect two or more additional samples. These samples are referred to as the "spare" samples. These additional samples must be collected over the same time period and according to the same procedures as those used for the "required" sample.

—Samples for "critical" metals must be daily composites.

—Samples for "noncritical" metals must be weekly composites, at a minimum. These samples can be composites of the original 8-hour samples, or they can be composites of daily composite samples.

• Analyze the "required" sample to determine the concentration of each metal.

—This analysis must be completed within 48 hours of the close of the sampling period. Failure to meet this schedule is a violation.

• If the "conservative" kiln dust metal concentration limit is exceeded for any metal, refer to Step 8.

• If the "conservative" kiln dust metal concentration limit is not exceeded, continue with the daily and/or weekly monitoring (Step 5) for the duration of interim status.

(6) This step does not apply to precompliance procedures.

(7) This step does not apply to precompliance procedures.

(8) If the "conservative" kiln dust metal concentration limit was exceeded for any metal in any single analysis of the "required" kiln dust sample, the "spare" samples corresponding to the same period may be analyzed to determine if the exceedance is due to a sampling or analysis error.

• If no "spare" samples were taken, refer to Step 9.

• If the average of all the samples for a given day (or week, as applicable) (including the "required" sample and the "spare" samples) does not exceed the "conservative" kiln dust metal concentration limit, no corrective measures are necessary; continue with the daily and/or weekly monitoring as described in Step 5.

• If the average of all the samples for a given day (or week, as applicable) exceeds the "conservative" kiln dust metal concentration limit, but the average of the "spare" samples is below the "conservative" kiln dust metal concentration limit, apply the Q-test, described in appendix A, to determine whether the "required" sample concentration can be judged as an outlier.

—If the "required" sample concentration is judged an outlier, no corrective measures are necessary; continue with the daily and/ or weekly monitoring described in Step 5.

—If the "required" sample concentration is not judged an outlier, refer to Step 10.

(9) This step does not apply to precompliance procedures.

(10) Determine if the "conservative" kiln dust metal concentration limit has been exceeded more than three times in the last 60 days.

• If not, log this exceedance and continue with the daily and/or weekly monitoring (Step 5).

• If so, the tests to determine the enrichment factors must be repeated (refer to Step 11).

• This determination is made separately for each metal; for example:

—Three exceedances for each of the ten hazardous metals are allowed within any 60-day period.

—Four exceedances of any single metal in any 60-day period is not allowed.

• This determination should be made daily, beginning on the first day of daily monitoring. For example, if four exceedances of any single metal occur in the first four days of daily monitoring, do not wait until the end of the 60-day period; refer immediately to Step 11.

(11) A revised certification of precompliance must be submitted to the Director (or certification of compliance must be submitted) if: (1) More than three exceedances of the "conservative" kiln dust metal concentration limit occur within any 60 consecutive daily samples; or (2) an exceedance of the "conservative" kiln dust metal concentration limit occurs in any weekly sample.

• The facility must notify the Director if a revised certification of precompliance must be submitted.

• The facility has up to 720 waste-burning hours to submit a certification of compliance or a revised certification of precompliance. During this period, the feed rate of the metal in violation must be reduced by 50%. In the case of a revised certification of precompliance, engineering judgement must be used to ensure that the "conservative" kiln dust metal concentration will not be exceeded. Examples of how this goal might be accomplished include:

—Changing equipment or operating procedures to reduce the kiln dust metal concentration;

—Changing equipment or operating procedures, or using more detailed engineering judgement, to decrease the estimated SEF and thus increase the "conservative" kiln dust metal concentration limit;

—Increasing the "conservative" kiln dust metal concentration limit by imposing a stricter PM emissions standard; or

—Increasing the "conservative" kiln dust metal concentration limit by performing a more detailed risk assessment to increase the metal emission limits.

• Meanwhile, the facility must continue with daily kiln dust metals monitoring (Step 5).

APPENDIX A TO APPENDIX IX TO PART 266—STATISTICS

A.1 *Determination of Enrichment Factor*

After at least 10 initial emissions tests are performed, an enrichment factor for each metal must be determined. At the 95% confidence level, the enrichment factor, $EF_{95\%}$s, is based on the test results and is statistically determined so there is only a 5% chance that the enrichment factor at any given time will be larger than $EF_{95\%}$. Similarly, at the 99% confidence level, the enrichment factor, $EF_{99\%}$, is statistically determined so there is only a 1% chance that the enrichment factor at any given time will be larger than $EF_{99\%}$.

For a large number of samples (n > 30), $EF_{95\%}$ is based on a normal distribution, and is equal to:

$$EF_{95\%}=EF+z_c\,\sigma \qquad (1)$$

where:

$$\overline{EF}=\frac{\sum_{i=1}^{n} EF_i}{n} \qquad (2)$$

$$\sigma=\left[\frac{\sum_{i=1}^{n}\left(EF_i=\overline{EF}\right)^2}{n}\right]^{\frac{1}{2}} \qquad (3)$$

For a 95% confidence level, z_c is equal to 1.645.

For a small number of samples (n<30), $EF_{95\%}$ is based on the t-distribution and is equal to:

$EF_{95\%} = EF + t_c\, S$ (4)

where the standard deviation, S, is defined as:

$$S = \left[\frac{\sum_{i=1}^{n} \left(EF_i - \overline{EF} \right)^2}{n-1} \right]^{\frac{1}{2}} \tag{5}$$

t_c is a function of the number of samples and the confidence level that is desired. It increases in value as the sample size decreases and the confidence level increases. The 95% confidence level is used in this method to calculate the "violation" kiln dust metal concentration limit; and the 99% confidence level is sometimes used to calculate the "conservative" kiln dust metal concentration limit. Values of t_c are shown in table A–1 for various degrees of freedom (degrees of freedom=sample size − 1) at the 95% and 99% confidence levels. As the sample size approaches infinity, the normal distribution is approached.

A.2 *Comparison of Enrichment Factor Groups*

To determine if the enrichment factors measured in the quarterly tests are significantly different from the enrichment factors determined in the initial Step 2 tests, the t-test is used. In this test, the value t_{meas}:

$$t_{meas} = \frac{\overline{EF}_1 - \overline{EF}_2}{\sigma_t \left(\frac{1}{n_1} + \frac{1}{n_2} \right)^{\frac{1}{2}}} \tag{6}$$

TABLE A–1.—T-DISTRIBUTION

$n-1$ or n_1+n_2-2	$t_{.95}$	$t_{.99}$
1	6.31	31.82
2	2.92	6.96
3	2.35	4.54
4	2.13	3.75
5	2.02	3.36
6	1.94	3.14
7	1.90	3.00
8	1.86	2.90
9	1.83	2.82
10	1.81	2.76
11	1.80	2.72
12	1.78	2.68
13	1.77	2.65
14	1.76	2.62
15	1.75	2.60
16	1.75	2.58
17	1.74	2.57
18	1.73	2.55
19	1.73	2.54
20	1.72	2.53
25	1.71	2.48
30	1.70	2.46
40	1.68	2.42
60	1.67	2.39
120	1.66	2.36
∞	1.645	2.33

$$\sigma_t = \left(\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2} \right)^{1/2} \tag{7}$$

is compared to t_{crit} at the desired confidence level. The 95% confidence level is used in this method. Values of t_{crit} are shown in table A-1 for various degrees of freedom (degrees of freedom n_1+n_2-2) at the 95% and 99% confidence levels. If t_{meas} is greater then t_{crit}, it can be concluded with 95% confidence that the two groups are not from the same population.

A.3 *Rejection of Data*

If the concentration of any hazardous metal in the "required" kiln dust sample exceeds the kiln dust metal concentration limit, the "spare" samples are analyzed. If the average of the combined "required" and "spare" values is still above the limit, a statistical test is used to decide if the upper value can be rejected.

The "Q-test" is used to determine if a data point can be rejected. The difference between the questionable result and its neighbor is divided by the spread of the entire data set. The resulting ratio, Q_{meas}, is then compared with rejection values that are critical for a particular degree of confidence, where Q_{meas} is:

$$\sigma^{meas} = \frac{DMC_{highest} - DMC_{next\ highest}}{DMC_{highest} - DMC_{lowest}} \qquad (8)$$

The 90% confidence level for data rejection is used in this method. Table A–2 provides the values of Q_{crit} at the 90% confidence level. If Q_{meas} is larger than Q_{crit}, the data point can be discarded. Only one data point from a sample group can be rejected using this method.

TABLE A–2.—CRITICAL VALUES FOR USE IN THE Q-TEST

n	Q_{crit}
3	0.94
4	0.76
5	0.64
6	0.56
7	0.51
8	0.47
9	0.44
10	0.41

[56 FR 32692, July 17, 1991 as amended 56 FR 42512, 42516, Aug. 27, 1991; 57 FR 38566, Aug. 25, 1992; 57 FR 44999, Sept. 30, 1992; 62 FR 32463, June 13, 1997]

Appendix XI—Lead-Bearing Materials That May be Processed in Exempt Lead Smelters

A. Exempt Lead-Bearing Materials When Generated or Originally Produced By Lead-Associated Industries [1]

Acid dump/fill solids
Sump mud
Materials from laboratory analyses
Acid filters
Baghouse bags
Clothing (e.g., coveralls, aprons, shoes, hats, gloves)
Sweepings
Air filter bags and cartridges
Respiratory cartridge filters
Shop abrasives
Stacking boards
Waste shipping containers (e.g., cartons, bags, drums, cardboard)
Paper hand towels
Wiping rags and sponges
Contaminated pallets
Water treatment sludges, filter cakes, residues, and solids
Emission control dusts, sludges, filter cakes, residues, and solids from lead-associated industries (e.g., K069 and D008 wastes)
Spent grids, posts, and separators
Spent batteries
Lead oxide and lead oxide residues
Lead plates and groups
Spent battery cases, covers, and vents
Pasting belts
Water filter media
Cheesecloth from pasting rollers
Pasting additive bags
Asphalt paving materials

B. Exempt Lead-Bearing Materials When Generated or Originally Produced By Any Industry

Charging jumpers and clips
Platen abrasive
Fluff from lead wire and cable casings
Lead-based pigments and compounding pigment dust

[1] Lead-associated industries are lead smelters, lead-acid battery manufacturing, and lead chemical manufacturing (e.g., manufacturing of lead oxide or other lead compounds).

Appendix XII—Nickel or Chromium-Bearing Materials that may be Processed in Exempt Nickel-Chromium Recovery Furnaces

A. Exempt Nickel or Chromium-Bearing Materials when Generated by Manufacturers or Users of Nickel, Chromium, or Iron

Baghouse bags
Raney nickel catalyst
Floor sweepings
Air filters
Electroplating bath filters
Wastewater filter media
Wood pallets
Disposable clothing (coveralls, aprons, hats, and gloves)
Laboratory samples and spent chemicals
Shipping containers and plastic liners from containers or vehicles used to transport nickel or chromium-containing wastes
Respirator cartridge filters
Paper hand towels

B. Exempt Nickel or Chromium-Bearing Materials when Generated by Any Industry

Electroplating wastewater treatment sludges (F006)
Nickel and/or chromium-containing solutions
Nickel, chromium, and iron catalysts
Nickel-cadmium and nickel-iron batteries
Filter cake from wet scrubber system water treatment plants in the specialty steel industry [1]
Filter cake from nickel-chromium alloy pickling operations [1]